6-8 MATHEMATICS PROCESS STANDARDS

Content Area	Number	Content Area Topic
Mathematics	1	Make sense of problems and persevere in solving them. Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” and "Is my answer reasonable?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches. Mathematically proficient students understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
Mathematics	2	Reason abstractly and quantitatively. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
Mathematics	3	Construct viable arguments and critique the reasoning of others. Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They organize their mathematical thinking, justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. They justify whether a given statement is true always, sometimes, or never. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies and use various methods of proof. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Mathematics	4	Model with mathematics. Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace using a variety of appropriate strategies. They create and use a variety of representations to solve problems and to organize and communicate mathematical ideas. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
Mathematics	5	Use appropriate tools strategically. Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts. Regarding technology, students use it strategically as a tool to support the development of learning mathematics. They use technology to contribute to concept development, simulation, representation, reasoning, communication, and problem solving. Note: Elementary students must learn how to fluently perform the basic arithmetic operations independent of the use of a calculator.
Mathematics	6	Attend to precision. Mathematically proficient students try to communicate precisely to others. They try to use clear definitions including correct mathematical language in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They express solutions clearly and logically by using the appropriate mathematical terms and notation. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently and check the validity of their results in the context of the problem. They express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Mathematics	7	Look for and make use of structure. Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x^2 + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)^2 as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
Mathematics	8	Look for and express regularity in repeated reasoning. Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x^2 + x + 1), and (x – 1)(x^3 + x^2 + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

MATHEMATICS: FIFTH GRADE

Content Area	Grade Level/Span	Strand	Number	Content Area Topic
Mathematics	5	Number Sense	1	Explain different interpretations of fractions: as parts of a whole, parts of a set, and division of whole numbers by whole numbers.
Mathematics	5	Number Sense	2	Compare and order fractions, mixed numbers, and decimals to thousandths by using >, =, and < symbols. Plot these numbers on a number line.
Mathematics	5	Number Sense	3	Identify and explain prime and composite numbers.
Mathematics	5	Number Sense	4	Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
Mathematics	5	Number Sense	5	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.
Mathematics	5	Number Sense	6	Use place value understanding to round decimals to any given place value.
Mathematics	5	Number Sense	7	Understand and interpret percents as a part of a hundred.
Mathematics	5	Computation	1	Evaluate expressions with parentheses or brackets involving whole numbers using the commutative, associative, and distributive properties.
Mathematics	5	Computation	2	Fluently multiply multi-digit whole numbers.
Mathematics	5	Computation	3	Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Explain the calculation by using a valid mathematical method.
Mathematics	5	Computation	4	Add, subtract, multiply, and divide decimals to hundredths, using models or drawings and strategies based on place value or the properties of operations. Explain the calculation by using a valid mathematical method.
Mathematics	5	Computation	5	Add and subtract fractions with unlike denominators (including mixed numbers).
Mathematics	5	Computation	6	Multiply a fraction by a fraction or whole number. Use a visual fraction model to represent a fraction times a whole number.
Mathematics	5	Computation	7	Compare the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
Mathematics	5	Computation	8	Explain why multiplying a number by a fraction greater than 1 results is a product greater than the given number. Explain why multiplying a number by a fraction less than 1 results in a product smaller than the given number. Relate the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.

Mathematics	5	Computation	9	Divide a unit fraction by a non-zero whole number. Divide a whole number by a unit fraction. Use a visual fraction model to represent these calculations.
Mathematics	5	Algebraic Thinking	1	Write linear algebraic expressions in one or two variables and evaluate them for given values.
Mathematics	5	Algebraic Thinking	2	Solve contextual word problems involving multiplication and division of whole numbers, e.g. by using equations to represent the problem. In division problems that involve remainders, explain how the remainder affects the solution to the problem.
Mathematics	5	Algebraic Thinking	3	Solve contextual word problems involving addition, subtraction, mutliplication, and division with decimals to hundredths (including problems that involve money in decimal notation), e.g. by using equations to represent the problem.
Mathematics	5	Algebraic Thinking	4	Solve contextual word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.
Mathematics	5	Algebraic Thinking	5	Solve contextual word problems involving multiplication of fractions (including mixed numbers), e.g., by using visual fraction models or equations to represent the problem.
Mathematics	5	Algebraic Thinking	6	Solve contextual word problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem.
Mathematics	5	Algebraic Thinking	7	Graph points with whole number coordinates on a coordinate plane. Explain how the coordinates relate the point as the distance from the origin on each axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).
Mathematics	5	Algebraic Thinking	8	Represent contextual word and math problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.
Mathematics	5	Algebraic Thinking	9	Generate two numerical patterns using two given rules. Identify relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.
Mathematics	5	Geometry	1	Identify, describe, classify, and draw triangles (right, acute, obtuse) and circles using a ruler or straightedge and compass. Understand the relationship between radius and diameter.
Mathematics	5	Geometry	2	Identify and classify polygons including quadrilaterals, pentagons, hexagons and triangles (i.e., equilateral, isosceles, scalene, right, acute and obtuse triangles) based on angle measures and sides. Classify polygons in a hierarchy based on properties. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.

Mathematics	5	Measurement	1	Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.
Mathematics	5	Measurement	2	Develop and use formulas for the area of triangles, parallelograms and trapezoids. Solve contextual word and math problems involving perimeter and area of these shapes using appropriate units for measures.
Mathematics	5	Measurement	3	Convert among different-sized standard measurement units within a given measurement system, and use these conversions in solving multi-step contextual word problems.
Mathematics	5	Measurement	4	Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Use the associative property of multiplication to represent volumes with whole number products.
Mathematics	5	Measurement	5	Apply the formulas V = l × w × h and V = b × h for right rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths to solve contextual word and math problems.
Mathematics	5	Measurement	6	Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve contextual word problems.
Mathematics	5	Data Analysis and Statistics	1	Formulate questions that can be addressed with data and make predictions about the data. Use observations, surveys, and experiments to collect, represent, and interpret the data using tables (including frequency tables), line plots, bar graphs, and line graphs. Consider how data-collection methods affect the nature of the data set.
Mathematics	5	Data Analysis and Statistics	2	Understand and use measures of center (mean and median) to represent a data set.

MATHEMATICS: SIXTH GRADE

Content Area	Grade Level/Span	Strand	Number	Content Area Topic
Mathematics	6	Number Sense	1	Understand that positive and negative numbers are used to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent and compare quantities in real-world contexts, explaining the meaning of 0 in each situation.
Mathematics	6	Number Sense	2	Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite.
Mathematics	6	Number Sense	3	Compare and order rational numbers and plot them on a number line. Write, interpret, and explain statements of order for rational numbers in real-world contexts.
Mathematics	6	Number Sense	4	Understand that the absolute value of a number is the distance from zero on a number line. Find the absolute value of real numbers and know that the distance between two numbers on the number line is the absolute value of their difference. Interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.
Mathematics	6	Number Sense	5	Recognize commonly used fractions (halves, thirds, fourths, fifths, tenths) and their decimal and percent equivalents. Convert between any two representations (fractions, decimals, percents) of positive rational numbers without the use of a calculator.
Mathematics	6	Number Sense	6	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor.
Mathematics	6	Number Sense	7	Interpret, model, and use ratios to show the relative sizes of two quantities. Use ratio language to describe a ratio relationship between two quantities. Use the notations: a/b, a to b, a:b.
Mathematics	6	Number Sense	8	Understand the concept of a unit rate and use rate language in the context of a ratio relationship.
Mathematics	6	Computation	1	Evaluate positive rational numbers with whole number exponents.
Mathematics	6	Computation	2	Compute quotients of fractions, and solve real-world problems involving division of fractions by fractions. Use a visual fraction model and/or equation to represent these calculations.
Mathematics	6	Computation	3	Apply the order of operations and the properties of real numbers (i.e., identity, inverse, commutative, associative and distributive properties) to evaluate numerical expressions with nonnegative rational numbers, including those that use grouping symbols like parentheses and involving whole number exponents. Justify each step in the process.
Mathematics	6	Computation	4	Solve one and two-step real-world problems involving addition, subtraction, multiplication and division of positive fractions and decimals.

Content Area	Grade Level/Span	Strand	Number	Content Area Topic
Mathematics	6	Computation	5	Use ratio and rate reasoning to solve real-world and mathematical problems with nonnegative rational numbers, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. Some examples: unit pricing, constant speed, discounts, tax, gratuities, simple interest, conversions within and across measurement systems, and problems that involve finding the whole given a part and the percent.
Mathematics	6	Computation	6	Fluently divide multi-digit whole numbers.
Mathematics	6	Computation	7	Fluently compute with positive fractions and positive decimals.
Mathematics	6	Algebra and Functions	1	Evaluate expressions at specific values of their variables including expressions with whole-number exponents and those that arise from formulas used in real-world problems.
Mathematics	6	Algebra and Functions	2	Apply the properties of operations (e.g., identity, inverse, commutative, associative, distributive properties) to create equivalent linear expressions and to justify whether two linear expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).
Mathematics	6	Algebra and Functions	3	Define and use variables when writing expressions to represent real-world and mathematical problems.
Mathematics	6	Algebra and Functions	4	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
Mathematics	6	Algebra and Functions	5	Fluently solve equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers. Represent real world problems using equations of these forms and solve such problems.
Mathematics	6	Algebra and Functions	6	Write an inequality of the form $x > c$, $x \geq c$, $x < c$, or $x \leq c$ to represent a constraint or condition in a real-world or mathematical problem where c is a rational number. Recognize that inequalities of these forms have infinitely many solutions and represent solutions on number line diagrams.
Mathematics	6	Algebra and Functions	7	Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. Graph points with rational number coordinates on a coordinate plane.
Mathematics	6	Algebra and Functions	8	Solve real-world and mathematical problems by graphing points with rational number coordinates on a coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
Mathematics	6	Algebra and Functions	9	Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane.
Mathematics	6	Algebra and Functions	10	Use variables to represent two quantities in a proportional relationship in a real-world problem; write an equation to express one quantity, the dependent variable, in terms of the other quantity, the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.

Content Area	Grade Level/Span	Strand	Number	Content Area Topic
Mathematics	6	Geometry and Measurement	1	Know that the sum of the interior angles of any triangle is 180º and that the sum of the interior angles of any quadrilateral is 360º. Use this information to solve real-world and mathematical problems.
Mathematics	6	Geometry and Measurement	2	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate; apply these techniques to solve real-world and mathematical problems.
Mathematics	6	Geometry and Measurement	3	Find the area of complex shapes composed of polygons by composing or decomposing into simple shapes; apply this technique to solve real-world and mathematical problems.
Mathematics	6	Geometry and Measurement	4	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths to solve real-world and mathematical problems.
Mathematics	6	Geometry and Measurement	5	Construct right rectangular prisms from nets and use the nets to compute the surface area of prisms; apply this technique to solve real-world and mathematical problems.
Mathematics	6	Data Analysis and Statistics	1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for the variability in the answers. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center (median and/or mean), spread (range, interquartile range and/or mean absolute deviation), and overall shape.
Mathematics	6	Data Analysis and Statistics	2	Select, create, and interpret graphical representations of numerical data, including line plots, histograms, and box plots.
Mathematics	6	Data Analysis and Statistics	3	Formulate statistical questions, and collect, organize, display, and interpret the data using line plots, histograms, and box plots.
Mathematics	6	Data Analysis and Statistics	4	Summarize numerical data sets in relation to their context, such as by: report the number of observations; describe the nature of the attribute under investigation, including how it was measured and its units of measurement; determine quantitative measures of center (median and/or mean) and variability (range, interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered; and relate the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

MATHEMATICS: SEVENTH GRADE

Content Area	Grade Level/Span	Strand	Number	Content Area Topic
Mathematics	7	Number Sense	1	Find the prime factorization of whole numbers. Write the results using exponents.
Mathematics	7	Number Sense	2	Understand the inverse relationship between squaring and finding the square root of a perfect square integer. Find square roots of perfect square integers.
Mathematics	7	Number Sense	3	Identify, compare, and order rational and common irrational numbers (√2, √3, √5, ∏) and plot them on a number line.
Mathematics	7	Number Sense	4	Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
Mathematics	7	Computation	1	Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
Mathematics	7	Computation	2	Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
Mathematics	7	Computation	3	Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers.
Mathematics	7	Computation	4	Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(–q).
Mathematics	7	Computation	5	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
Mathematics	7	Computation	6	Use proportional relationships to solve multistep ratio and percent problems. Some examples: simple interest, tax, markups, markdowns, gratuities, commissions, fees, conversions within and across measurement systems, percent increase and decrease, and percent error.
Mathematics	7	Computation	7	Fluently compute with rational numbers.
Mathematics	7	Computation	8	Solve one and two-step real-world problems involving addition, subtraction, multiplication, and division with rational numbers.
Mathematics	7	Algebra and Functions	1	Apply the properties of operations (e.g., identity, inverse, commutative, associative, distributive properties) to add, subtract, factor, and expand linear expressions. Justify each step in the process
Mathematics	7	Algebra and Functions	2	Define slope as vertical change for each unit of horizontal change and recognize that a constant rate of change or constant slope describes a linear function. Identify and describe situations with constant or varying rates of change.
Mathematics	7	Algebra and Functions	3	Graph a line given its slope and a point on the line. Find the slope of a line given its graph.

Content Area	Grade Level/Span	Strand	Number	Content Area Topic
Mathematics	7	Algebra and Functions	4	Identify the unit rate or constant of proportionality in tables, graphs, equations, and verbal descriptions of proportional relationships.
Mathematics	7	Algebra and Functions	5	Explain what the coordinates of a point on the graph of a proportional relationship mean in terms of the situation, with special attention to the points (0, 0) and (1,r) where r is the unit rate.
Mathematics	7	Algebra and Functions	6	Identify real world and mathematical situations that involve proportional relationships. Write equations and draw graphs to represent proportional relationships and recognize that these situations are described by a linear function in the form y = mx, where the unit rate m is the slope of the line.
Mathematics	7	Algebra and Functions	7	Fluently solve equations of the form px + q= r and p(x + q) = r, where p, q, and r are specific rational numbers. Represent real world problems using equations of these forms and solve such problems.
Mathematics	7	Algebra and Functions	8	Solve inequalities of the form px +q (> or ≥) r or px + q (< or ≤) r, where p, q, and r are specific rational numbers. Represent real world problems using inequalities of these forms and solve such problems. Graph the solution set of the inequality and interpret it in the context of the problem.
Mathematics	7	Geometry and Measurement	1	Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
Mathematics	7	Geometry and Measurement	2	Identify, describe and construct similarity relationships and solve problems involving similarity (including similar triangles).
Mathematics	7	Geometry and Measurement	3	Solve real-world and mathematical problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing. Create a scale drawing by using proportional reasoning.
Mathematics	7	Geometry and Measurement	4	Solve real-world and mathematical problems that involve vertical, adjacent, complementary, and supplementary angles.
Mathematics	7	Geometry and Measurement	5	Understand the formulas for area and circumference of a circle and use them to solve real-world and mathematical problems; give an informal derivation of the relationship between circumference and area of a circle.
Mathematics	7	Geometry and Measurement	6	Solve real-world and mathematical problems involving volume of three-dimensional objects composed of right rectangular prisms. Solve real-world and mathematical problems involving volume of cylinders.
Mathematics	7	Geometry and Measurement	7	Construct nets for right rectangular prisms and cylinders. Solve real world and mathematical problems involving surface area of right rectangular prisms and cylinders.
Mathematics	7	Data Analysis, Statistics, and Probability	1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
Mathematics	7	Data Analysis, Statistics, and Probability	2	Use data from a random sample to draw inferences about a population. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

Content Area	Grade Level/Span	Strand	Number	Content Area Topic
Mathematics	7	Data Analysis, Statistics, and Probability	3	Make observations about the degree of visual overlap of two numerical data distributions represented in line plots or box plots. Describe how additional data, particularly outliers, added to a data set may affect the mean and/or median.
Mathematics	7	Data Analysis, Statistics, and Probability	4	Find, use, and interpret measures of center (mean and median) and measures of variability (range, interquartile range, and mean absolute deviation) for numerical data from random samples to draw comparative inferences about two populations.
Mathematics	7	Data Analysis, Statistics, and Probability	5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. A probability of 1 indicates an event certain to occur and a probability of 0 indicates an event impossible to occur.
Mathematics	7	Data Analysis, Statistics, and Probability	6	Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its relative frequency from a large sample. Predict the approximate relative frequency of an event given the probability.
Mathematics	7	Data Analysis, Statistics, and Probability	7	Develop and use probability models (both uniform and not) to determine probabilities of simple events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

MATHEMATICS: EIGHTH GRADE

Content Area	Grade Level/Span	Strand	Number	Content Area Topic
Mathematics	8	Number Sense	1	Know that there are numbers that are rational and irrational and explain the difference between them. Give examples of rational and irrational numbers. Understand that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats into a rational number.
Mathematics	8	Number Sense	2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions involving irrational numbers.
Mathematics	8	Number Sense	3	Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, 3^2 × 3^–5 = 3^–3 = 1/3^3 = 1/27.
Mathematics	8	Number Sense	4	Use square root and cube root symbols to represent solutions to equations of the form x^2 = p and x^3 = p, where p is a positive rational number. Evaluate square roots of perfect squares and cube roots of perfect cubes.
Mathematics	8	Computation	1	Solve multi-step real-world problems involving addition, subtraction, multiplication, and division with rational numbers.
Mathematics	8	Computation	2	Solve real-world and mathematical problems involving numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Interpret scientific notation that has been generated by technology, such as, a scientific calculator, graphing calculator, and excel spreadsheet.
Mathematics	8	Algebra and Functions	1	Fluently solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. Represent real-world problems using linear equations and solve such problems.
Mathematics	8	Algebra and Functions	2	Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by transforming a given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).
Mathematics	8	Algebra and Functions	3	Construct a function to model a linear relationship between two quantities given a verbal description, table of values, or graph. Recognize in y = mx + b that m is the slope (rate of change) and b is the y-intercept of the graph and describe the meaning of each in the context of a problem.
Mathematics	8	Algebra and Functions	4	Compare two different linear relationships given in different forms (table of values, equation, verbal description, and graph). For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.
Mathematics	8	Algebra and Functions	5	Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
Mathematics	8	Algebra and Functions	6	Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations.
Mathematics	8	Algebra and Functions	7	Write a system of two linear equations that represents a real-world problem and solve the problem.

Content Area	Grade Level/Span	Strand	Number	Content Area Topic
Mathematics	8	Algebra and Functions	8	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
Mathematics	8	Algebra and Functions	9	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear, has a maximum or minimum value). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.
Mathematics	8	Algebra and Functions	10	Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. Describe similarities and differences between linear and nonlinear functions from tables, graphs, verbal descriptions, and equations.
Mathematics	8	Geometry and Measurement	1	Perform constructions with or without technology: angle and segment bisectors, copies of segments and angles, and perpendicular segments. Describe and justify the constructions.
Mathematics	8	Geometry and Measurement	2	Identify, define and describe attributes of three-dimensional geometric objects (right rectangular prisms, cylinders, cones, spheres, and pyramids) and describe the two-dimensional figure that results from slicing these objects.
Mathematics	8	Geometry and Measurement	3	Verify experimentally the properties of rotations, reflections, and translations; lines are mapped to lines, and line segments to line segments of the same length; angles are mapped to angles of the same measure; and parallel lines are mapped to parallel lines.
Mathematics	8	Geometry and Measurement	4	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
Mathematics	8	Geometry and Measurement	5	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar figures, describe a sequence that exhibits the similarity between them.
Mathematics	8	Geometry and Measurement	6	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
Mathematics	8	Geometry and Measurement	7	Know facts about the angle sum and exterior angles of triangles, angles created when parallel lines are cut by a transversal (corresponding, alternate interior, alternate exterior, consecutive interior, consecutive exterior, vertical), and angle-angle criterion for similarity of triangles. Use this information to solve real-world and mathematical problems.
Mathematics	8	Geometry and Measurement	8	Explain the reasoning of a given proof of the Pythagorean Theorem and its converse.
Mathematics	8	Geometry and Measurement	9	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two dimensions.
Mathematics	8	Geometry and Measurement	10	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
Mathematics	8	Geometry and Measurement	11	Solve real-world and mathematical problems involving volume and surface area of cones, spheres, and pyramids.

Content Area	Grade Level/Span	Strand	Number	Content Area Topic
Mathematics	8	Data Analysis, Statistics, and Probability	1	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
Mathematics	8	Data Analysis, Statistics, and Probability	2	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and describe the model fit by judging the closeness of the data points to the line.
Mathematics	8	Data Analysis, Statistics, and Probability	3	Write and use an equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and y-intercept.
Mathematics	8	Data Analysis, Statistics, and Probability	4	Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.
Mathematics	8	Data Analysis, Statistics, and Probability	5	Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. Understand and use appropriate terminology to describe independent, dependent, complementary, and mutually exclusive events.
Mathematics	8	Data Analysis, Statistics, and Probability	6	Represent sample spaces and find probabilities of compound events (independent and dependent) using methods such as organized lists, tables, and tree diagrams.
Mathematics	8	Data Analysis, Statistics, and Probability	7	For events with a large number of outcomes, understand the use of the Multiplication Counting Principle. Develop the Multiplication Counting Principle and apply it to situations with a large number of outcomes.

Algebra 1

Content Area	Course	Strand	Number	Content Area Topic
Mathematics	Algebra 1	Number Sense	1	Understand the heirarchy and relationships of numbers and sets of numbers within the Real Number System.
Mathematics	Algebra 1	Number Sense	2	Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. *
Mathematics	Algebra 1	Number Sense	3	Rewrite and evaluate numeric expressions with positive rational exponents using the properties of exponents.
Mathematics	Algebra 1	Linear equations and inequalities	1	Fluently solve linear equations and inequalities in one variable. Explain and justify each step in solving an equation starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
Mathematics	Algebra 1	Linear equations and inequalities	2	Understand that the logic of equation solving begins with the assumption that the variable is a number that satisfies the equation and that the steps taken when solving equations create new equations that have, in most cases, the same solution as the original. Understand that similar logic applies to solving systems of equations simultaneously.
Mathematics	Algebra 1	Linear equations and inequalities	3	Represent real-world problems using linear equations and inequalities and solve such problems. Interpret the solution(s) and determine if the solution(s) is reasonable.
Mathematics	Algebra 1	Linear equations and inequalities	4	Solve equations and formulas for a specified variable including equations with coefficients represented by letters
Mathematics	Algebra 1	Linear equations and inequalities	5	Solve compound linear inequalities using properties of order.
Mathematics	Algebra 1	Functions	6	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
Mathematics	Algebra 1	Functions	7	Identify the domain and range of relations represented in tables, graphs, verbal descriptions, and equations.
Mathematics	Algebra 1	Functions	8	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). Represent linear functions as graphs from equations.
Mathematics	Algebra 1	Functions	9	Represent linear functions in real-world problems using tables, graphs, verbal descriptions, and equations. Translate fluently among tables, graphs, verbal descriptions, and equations. Determine and interpret the slope and intercepts of linear functions. Use graphing technology in situations that involve more complex numbers.
Mathematics	Algebra 1	Functions	10	Translate among equivalent forms of equations for linear functions (i.e., slope-intercept, point-slope and standard). Recognize that different forms reveal more or less information about a given situation
Mathematics	Algebra 1	Functions	11	Graph a linear inequality in two variables to determine the solution set of the inequality.
Mathematics	Algebra 1	Systems	12	Graph a pair of linear inequalities in two variables with and without technology to determine the solution set of the inequality.
Mathematics	Algebra 1	Systems	13	Understand that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. Compare linear functions and exponential functions using tables, graphs and equations.
Mathematics	Algebra 1	Systems	14	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
Mathematics	Algebra 1	Systems	15	Understand the relationship between a solution of a pair of linear equations in two variables and the graphs of the corresponding lines. Solve pairs of linear equations in two variables by graphing (exact or approximate) , substitution or elimination.
Mathematics	Algebra 1	Systems	16	Write a system of two linear equations that represents a real-world problem and solve the problem. Interpret the solution and determine if the solution is reasonable. Use graphing technology in situations that involve more complex numbers.
Mathematics	Algebra 1	Quadratics and Polynomials	17	Understand that polynomials are closed under the operations of addition, subtraction, and multiplication with integers; Add, subtract and multiply polynomials and divide polynomials by monomials.
Mathematics	Algebra 1	Quadratics and Polynomials	18	Factor common terms from polynomials and factor polynomials completely.
Mathematics	Algebra 1	Quadratics and Polynomials	19	Factor the difference of two squares, perfect square trinomials and other quadratic expression.

Mathematics	Algebra 1	Quadratics and Polynomials	20	Solve quadratic equations by inspection (e.g., for x^2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation.	
Mathematics	Algebra 1	Quadratics and Polynomials	21	Graph and describe quadratic functions with and without technology. Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.	
Mathematics	Algebra 1	Quadratics and Polynomials	22	Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.	
Mathematics	Algebra 1	Quadratics and Polynomials	23	Recognize and describe the relationships among the solutions of an equation, the zeros of a function, the x-intercepts of a graph and the factors of a polynomial expression.	
Mathematics	Algebra 1	Quadratics and Polynomials	24	Represent real-world problems using quadratic equations and solve such problems. Interpret the solution(s) and determine if the solution(s) is reasonable. Use graphing technology in situations that involve more complex numbers.	
Mathematics	Algebra 1	Functions	25	Rewrite square roots of non-perfect square integers and algebraic monomials	
Mathematics	Algebra 1	Functions	26	Use graphing technology to find approximate solutions of exponential and power functions.	
Mathematics	Algebra 1	Functions	27	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear, has a maximum or minimum value). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. Identify independent and dependent variables and make predictions about the relationship.	
Mathematics	Algebra 1	Algebraic Rational Expressions	28	Rewrite algebraic rational expressions in equivalent forms (i.e. numerators and denominators are monomial expressions with integer exponents).	* limit
Mathematics	Algebra 1	Algebraic Rational Expressions	29	Write and solve algebraic proportions that lead to a linear equation including real-world problems.	
Mathematics	Algebra 1	Data Analysis & Probability	1	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.	
Mathematics	Algebra 1	Data Analysis & Probability	2	Use technology to write a linear function that represents data in a scatter plot representing a linear association. Interpret the slope and y-intercept in the context of the data. Compute (using technology) and interpret the correlation coefficient.	
Mathematics	Algebra 1	Data Analysis & Probability	3	Distinguish between correlation and causation. Evaluate reports based on data by considering the source of the data, the design of the study, the way the data are analyzed and displayed and whether the report confuses correlation with causation.	
Mathematics	Algebra 1	Data Analysis & Probability	4	Summarize categorical data for two categories, that has been collected or provided, in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations, trends in the data and answer questions about the data.	
Mathematics	Algebra 1	Data Analysis & Probability	5	Organize, display and analyze univariate and bivariate data (e.g. using tables, line plots, histograms and box plots). Summarize the data using measures of center (e.g. mean, median) and spread (e.g, range, inter-quartile range, percentiles, variance). Understand the effects of outliers on the data.	